GP-303337

REMARKS

Claims 1-22 are pending in the present Application. Claims 1, 12, 21, and 22 have been amended, leaving Claims 1-22 for consideration upon entry of the present Amendment. No new matter has been introduced by these amendments. For example, support for the amendments to Claims 1, 12, and 21 can be found at least in Figure 1 of the instant Specification as originally filed. Support for the amendment to Claim 22 can be found at least in paragraph [0027] of the instant Specification as originally filed. Furthermore, no new issues requiring further search and/or consideration are raised herein. The amendments place the application in condition for allowance or, alternatively, the amendments place the application in better form for appeal. Thus, in accordance with 37 C.F.R. §1.116 and MPEP §714.12, entry of this Response is respectfully requested at this time (i.e., after final rejection).

Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

First Claim Rejection Under 35 U.S.C. § 103(a)

Claims 1-5, 8, 10-14, 17, 19, 20, and 21 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 5,992,582 to Lou et al. (hereinafter "Lou") in view of U.S. Patent No. 6,394,239 to Carlson (hereinafter "Carlson"). Applicants respectfully traverse this rejection.

Currently amended independent Claim 1 is directed to a screw-type magnetorheological damper, comprising a thrust shaft comprising an external threaded surface in threaded communication with a sealed housing, wherein at least one end of the thrust shaft extends from the housing; at least one rotor disposed in the housing comprising a planar surface with a centrally located aperture, **wherein the at least one rotor is in direct contact and rotatably engaged with the threaded surface of the thrust shaft**; at least one stator spaced apart from and adjacent to the at least one rotor, **wherein the at least one stator is fixedly attached to the housing** and comprises a centrally located aperture dimensioned to accommodate vertical movement of the

thrust shaft and a planar surface substantially parallel to the planar surface of the at least one rotor; a magnetorheological fluid disposed in a space defined by the at least one rotor and the at least one stator; and means for applying a substantially perpendicular magnetic field to the magnetorheological fluid relative to the planar surface of the at least one stator.

Currently amended independent Claim 12 is directed to a screw-type magnetorheological damper, comprising a thrust shaft comprising an external threaded surface in threaded communication with a sealed housing, wherein at least one end of the thrust shaft extends from the housing; a plurality of rotors and stators alternatingly arranged in the housing, wherein each of the plurality of rotors comprise a planar surface with a centrally located aperture, **wherein each of the plurality of rotors is in direct contact with and rotatably engaged with the threaded surface of the thrust shaft, wherein each of the plurality of stators is fixedly attached to the housing** and comprises a centrally located aperture dimensioned to accommodate vertical movement of the thrust shaft and a planar surface substantially parallel to the planar surface of the plurality of rotors, and wherein alternating stators comprise a permanent magnet or an electromagnet; and a magnetorheological fluid disposed in a space defined by the plurality of rotors and stators.

Currently amended independent Claim 21 is directed to a process for operating a screw-type magnetorheological damper for variably converting a linear force to a rotary force, comprising axially applying a force to a thrust shaft of a screw-type magnetorheological damper, wherein the screw-type magnetorheological damper comprises the thrust shaft having an external threaded surface in threaded communication with a sealed housing, at least one rotor disposed in the sealed housing comprising a planar surface with a centrally located aperture, **wherein the at least one rotor is in direct contact and rotatably engaged with the threaded surface of the thrust shaft**, at least one stator spaced apart from and adjacent to the at least one rotor, **wherein the at least one stator is fixedly attached to the housing** and comprises a centrally located aperture dimensioned to accommodate vertical movement of the thrust shaft and a planar surface substantially parallel to the planar surface of the at least one rotor, and a magnetorheological fluid disposed in a space defined by the at least one rotor and the at least one stator; and variably

applying a substantially perpendicular magnetic field to the magnetorheological fluid relative to the planar surface of the at least one stator so as to variably covert the linear force applied to the thrust shaft into the rotary force.

Lou is generally directed to rotary damping devices that utilize electrorheological fluids and provide electronically controllable damping to various vibrations.

Carlson is generally directed to damping, resistance control, and motion controlling devices based on magnetorheological fluids.

For an obviousness rejection to be proper, the Examiner must meet the burden of establishing a *prima facie* case of obviousness, i.e., that all elements of the invention are disclosed in the prior art; that the prior art relied upon, coupled with knowledge generally available in the art at the time of the invention, contain some suggestion or incentive that would have motivated the skilled artisan to modify a reference or combined references; and that the proposed modification of the prior art had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *In re Fine*, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988); *In re Wilson*, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970); *Amgen v. Chugai Pharmaceuticals Co.*, 927 U.S.P.Q.2d, 1016, 1023 (Fed. Cir. 1996).

Applicants assert that a *prima facie* case of obviousness has not been established because the cited reference fails to teach or suggest all elements of Applicants' independent Claims 1, 12, and 21. Specifically, there is no mention or suggestion of a rotor or plurality of rotors comprising "a planar surface with a centrally located aperture wherein the at least one rotor is in **direct contact** and rotatably engaged with the threaded surface of the thrust shaft"; nor is there mention or suggestion of a stator or a plurality of stators that "is **fixedly attached** to the housing".

The Examiner's attention is respectfully directed to the relevant text of Lou regarding the rotor and stator, which has been reproduced for convenience as shown below.

> **A plurality of rotor-electrodes 21 are mechanically and electrically connected to the rotor 26 with the help of one or more rotor feather keys 18. A plurality of stator-electrodes 22 are mechanically and electrically connected to the**

> **stator 29 with the help of one or more stator feather keys 17.** The stator feather keys 17 and the rotor feather keys 18 are electrically conductive. The numbers of the rotor-electrodes 21 and the stator-electrodes 22 may vary from those shown in FIG. 1, and they are selected according to the performance requirements of the ER damper 3. The rotor-electrodes 21 and the stator- electrodes 22 are arranged alternatively, facing each other, along the axis of the ER damper 3 and are separated by an ER fluid 30. The ER fluid 30 fills the entire cavity bordered by the rotor 26 and the stator 29.
>
> (Lou, column 3, lines 46-59, emphasis added)

As stated in the text, and evidenced in Figures 1 and 2, of Lou, each of the plurality of rotor electrodes are connected to a single rotor, with the help of rotor feather keys and the rotor itself interacts with the shaft by a "screw-nut mechanism 11" (column 4, line 37). Also from the text and figures of Lou, each of the plurality of stator electrodes are connected to a single stator (i.e., housing) with the help of one or more stator feather keys. The Examiner, on Page 3 of the previous Office Action (Paper No. 3), and again on Pages 3 and 6 of the present Office Action (Paper No. 4) has correctly acknowledged that the rotor and stator electrodes are, "connected indirectly to the shaft and housing", respectively. However, Applicants contend that if the rotor electrodes are indirectly connected to the shaft, they cannot be in direct contact with the shaft, as presently claimed. Furthermore, Applicants also contend that if the stator electrodes are indirectly connected to the housing, they cannot be fixedly attached to the housing, as presently claimed. The features of the dampers described and taught by Lou are markedly different from Applicants claimed invention. In view of the foregoing, all elements of Applicants independent Claims 1, 12, and 21 have not been taught or suggested by Lou.

Carlson fails to compensate for the deficiencies of Lou. Notably absent from Carlson is any mention or suggestion of a screw-type damper. Instead, Carlson is simply relied upon in the Office Action to establish that magnetorheological fluids can substitute for the electrorheological fluids as disclosed by Lou. Thus, the combination of Lou and Carlson still does not teach or suggest all elements of Applicants independent Claims 1, 12, and 21.

Accordingly, Applicants respectfully request withdrawal of the rejection to independent Claims 1, 12, and 21. Given that Claims 2-5, 8, 10, 11, 13, 14, 17, 19, and 20 depend from, and include all the limitation of, their respective base claims, they too are patentable.

Second Claim Rejection Under 35 U.S.C. § 103(a)

Claims 6, 7, 9, 15, 16, and 18 stand rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Lou in view of Carlson as applied to Claims 1 and 12 in the First Claim Rejection Under 35 U.S.C. § 103(a) above, and further in view of U.S. Patent No. 5,900,184 to Weiss et al. (hereinafter "Weiss"). Applicants respectfully traverse this rejection.

Lou and Carlson are discussed above.

Weiss is generally directed to magnetorheological fluid formulations.

Applicants assert that a *prima facie* case of obviousness has not been established against Applicants independent Claims 1 and 12 because Weiss fails to compensate for the deficiencies of Lou and Carlson. Since Weiss is directed only to magnetorheological fluid compositions, Weiss is silent regarding a rotor or plurality of rotors comprising "a planar surface with a centrally located aperture wherein the at least one rotor is in **direct contact** and rotatably engaged with the threaded surface of the thrust shaft" as well as a stator or a plurality of stators that "is **fixedly attached** to the housing". Thus, the cited references fail to teach all elements of the invention.

Accordingly, Applicants respectfully request withdrawal of the rejection to Claims 6, 7, 9, 15, 16, and 18.

Third Claim Rejection Under 35 U.S.C. § 103(a)

Claim 22 stands rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over U.S. Patent No. 6,279,701 to Namuduri et al. (hereinafter "Namuduri") in view of U.S. Patent No. 6,471,018 to Gordaninejad et al. (hereinafter "Gordaninejad"). Applicants respectfully traverse this rejection.

Currently amended independent Claim 22 is directed to a magnetorheological damper, the damper comprising a cylindrically shaped housing; a magnetorheological fluid disposed in the cylindrically shaped housing; a piston assembly disposed within the cylindrically shaped housing in sliding engagement with the cylindrically shaped housing defining a first chamber and a second chamber, wherein the piston assembly comprises an annular starburst flow channel extending from the first chamber to the second chamber, and an electromagnet centrally disposed in the piston assembly, wherein a cross sectional area provided by the annular starburst flow channel is at least about 30 percent of available cross sectional area of the piston assembly; and a power supply in electrical communication with the electromagnet.

Namuduri is generally directed to magnetorheological fluid dampers with multiple concentric annular flow gaps for increased damping force and turn-up ratios.

Gordaninejad is generally directed to magnetorheological fluid dampers.

Applicants assert that a *prima facie* case of obviousness has not been established because all elements of the rejected claim have not been taught or suggested by the cited art. Specifically, there is no mention or suggestion of an annular starburst flow channel, wherein a cross sectional area provided by the annular starburst flow channel is at least about 30 percent of available cross sectional area of the piston assembly. Namuduri teaches multiple **concentric** annular flow channels. Gordaninejad teaches flow passages on the exterior surface of the piston, which can be straight or curved, such as a spiral, portion of a spiral, or a staircase. Neither reference discloses or suggests an annular starburst flow channel as instantly claimed.

Furthermore, Applicants contend that modifying the flow passage taught by Namuduri and Gordaninejad to a particular shape simply dependent on the damping characteristics desired is not an obvious matter of design choice as suggested by the Office Action. The Examiner's attention is respectfully directed to the Specification of the instant Application, the relevant portion of which has been reproduced for convenience as shown below.

> A piston bearing 74 is mounted on an annular surface of the piston assembly 52 for permitting smooth sliding contact along a wall of the cylindrically shaped

> housing 54 while creating a fluidic seal between the first chamber 62 and the second chamber 64. The piston assembly 52 further includes an annular starburst shaped flow channel 76 extending through the piston assembly 52 so as to permit fluid communication of the MR fluid between the first and second chambers 62, 64, respectively. Shown more clearly in Figure 3, **the annular starburst shaped flow channel 76 has a generally jagged shaped cross section, thereby providing the capability of a significantly greater cross sectional surface area than in previous designs.** The cross sectional area provided by the annular starburst flow channel 76 generally depends on the desired application. In order to maximize the turn-up ratio, it is preferred that the cross sectional area provided by the annular star burst flow channel 76 represent at least about 30 percent of the available cross sectional area of the piston assembly 52, with greater than about 40 percent more preferred, and with greater than 50 percent even more preferred (the theoretical upper limit being about 78 percent). In practical use, this can probably be no more than 60 percent as the cell walls require a sufficient thickness, i.e., yield strength, to withstand applied loads. **The increase in volume provided by the annular starburst flow channel 76 increases the shear interface value, thereby enhancing the stroking force.**
>
> (Instant Application, paragraph [0027], emphasis added)

As discussed in paragraph [0027], the annular starburst flow channel shape advantageously provides significantly greater cross sectional surface area than in previous designs. Applicants also point out that Namuduri and Gordaninejad are silent regarding the cross sectional area provided by the shaped fluid passage channel. This instantly claimed feature (i.e., "a cross sectional area provided by the annular starburst flow channel is at least about 30 percent of available cross sectional area of the piston assembly"), as discussed in paragraph [0027], allows for increased shear interface value, which enhances the stroking force compared to previous designs. Therefore modifying Namuduri and/or Gordaninejad in a manner to obtain Applicants' invention as in Claim 22 would not have been obvious to one of ordinary skill in the art.

Accordingly, Applicants respectfully request withdrawal of the rejection to Claim 22.

It is believed that the foregoing amendments and remarks fully comply with the Office Action and that the claims herein should now be allowable to Applicants. Accordingly, reconsideration and allowance are requested.

GP-303337

If there are any additional charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130.

Respectfully submitted,

CANTOR COLBURN LLP

By _____
Peter R. Hagerty
Registration No. 42,618

Date: March 28, 2005
CANTOR COLBURN LLP
55 Griffin Road South
Bloomfield, CT 06002
Telephone (860) 286-2929
Facsimile (860) 286-0115
Customer No.: 23413